

The Hatch/Xenolite Cigar Box Instrument and How to Build it

by

S. K. Deitch



Introduction

In early 2018 I was unemployed and trying very hard to keep busy. I started going to the WPFL Hatch Maker Space. If you are reading this, in all likelihood that is where you are right now.

In my life there have been a lot of creative pursuits, music, art, writing, etc. Basically I make stuff. It is what I have always done. When I came to Hatch I started decorating cigar boxes because I had a constant supply of them from the smoking club around the corner from Hatch and my apartment. I learned how to use a number of the interesting tools available there, most importantly the Epilog laser cutter. I started using it to make engravings on the boxes I was working on and became pretty adept at its use. I also became a volunteer at Hatch and for as long as I was unemployed, I was there pretty much every day. Nowadays I am only around for a few hours on the weekends, but I try to stay as involved as time allows.

Anyway, Liz Helfer, the energetic and inspiring young woman who runs Hatch knew that I was a bit musical and worked with cigar boxes suggested that maybe I could do a workshop on making a cigar box ukulele. I actually had made one before, but it was hardly from scratch. I had used parts from a broken student sized guitar I had found in the trash. I still have it. It plays nicely, but it wasn't really challenging to make. I replaced the broken body with a cigar box using the neck and bridge taken from it without alteration. I didn't feel really qualified to come up with a way to build a uke from the ground up using a method that I could also *teach* to people.

I went online and found a plan for an easy and inexpensive to build cigar box ukulele designed by a musician named Shelley Rickey. It attracted me mostly because she had used zip ties for frets which *seemed* like a simple solution to the problem of making frets. More about that later. You can see the original plan here, also listen to her demo. She has a lovely voice:

<https://cigarboxnation.com/forum/topics/build-this-simple-cigar-box-uke-for-under-20>

My instrument was originally based on Ms. Rickey's plan, but I have changed a lot of it over time. The main thing from it I have preserved is the

“spine” construction that has the cigar box itself not bearing the tension of the strings.

Early on, I discovered that the zip tie frets were far more trouble to make than simply using regular fret wire. Fret wire is more expensive, but far less swearing is involved in using it. In the workshops I used inexpensive machine tuners. The workshop version of the uke only had five frets, mostly to save time, but I should point out that with five frets literally *thousands* of songs can be played.

I decided to make the Hatch Uke a baritone. It would be a little larger, be a little bit more forgiving of small errors in construction.

I also decided to pre-fabricate some of the more difficult elements such as cutting the F holes and rough shaping the neck. Liz actually went out and bought a band saw to rough cut the necks and cut them for the workshops. Yeah, she wanted a band saw anyway and I’m sure was happy for the excuse to get one.

The workshops, one in the summer and one in the fall, went well enough sending home people with finished or near finished instruments, but I was still trying to improve the design. Over time I abandoned machine tuners in favor of violin style friction pegs and designed an easy to make headpiece. I started laser engraving the box tops with various designs. Before long the instruments I was making bore little resemblance to Shelly Rickey’s design.

What I present here is not a set of plans, but a general method for making a stringed instrument. I don’t really think of them as Ukuleles anymore. They are a basic four stringed, fretted instrument that can be tuned and played a number of ways and there is much room for variation.

In this volume I will discuss the basic methods and a few variations you might want to try.

-Seth K. Deitch 2/10/2019

Things you will need.

Poplar Board 3/4" x 1 1/2" x 27 1/2"

A **wood** cigar box approximately 11" x 7 1/2 " x 2 1/2 " but you can work with a wide variation of sizes.

Four friction tuning pegs. Available here:

https://www.amazon.com/gp/product/B01BV0M8WU/ref=ppx_yo_dt_b_asin_title_o00__o00_s00?ie=UTF8&psc=1

Some fret wire. Available here, but you might find it cheaper on Ebay:

https://www.amazon.com/Guitar-Fretwires-Classical-Acoustic-Guitars/dp/B07H4MN1CV/ref=sr_1_1_sspa?keywords=fret+wire&qid=1549842085&s=musical-instruments&sr=1-1-spons&psc=1

A set of baritone ukulele strings

Scrap of 1/8" plywood

A short length of dowel 1/4" -1/2" diameter

A few scraps of 1/8" and 1/4" acrylic plexiglass

A miter box

A coping saw

A Drill w/ 1/4", 5/8", 1/16" and 1/32" bits

Sandpaper, various grits

A pair of nippers

A rasp

A flat file, a triangular file and a fairly narrow round file

A jig saw

A flathead screw driver

5 minute epoxy

Clamps

Also it would be nice if you had these things, but you can still complete the project without them:



A luthier's fret dressing file,

A violin peg reamer

Some tiny screw eyes

Before you start, you ought to read this all the way through once

The Spine: part 1

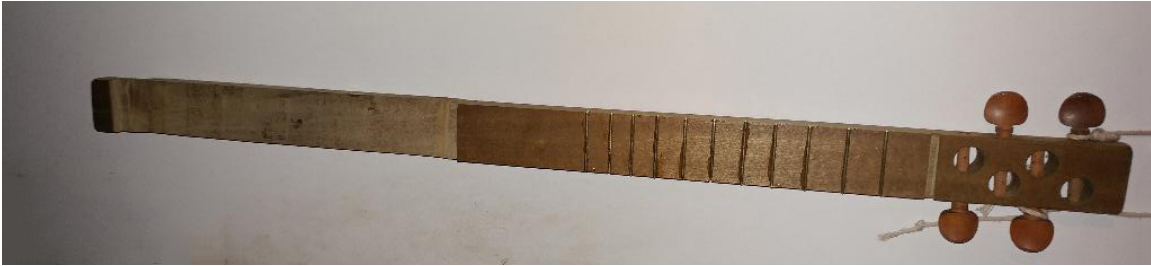


Fig.1

This is what was called in Ms Rickey's plan the neck, but it is actually the entire backbone of the instrument (Fig.1). It incorporates the headstock, neck and finger board, tailpiece as well as internal support within the box itself.

Get a hold of some nice, straight Poplar 1 x 2, approximately 27.5 inches of it.

At one end of the board drill 4 1/4" holes through the narrow edge slightly over 1/2" apart. Next drill 5/8" holes on the broad face of the board so that they intersect with the other holes. Stager their positions to either side. (Fig.2)

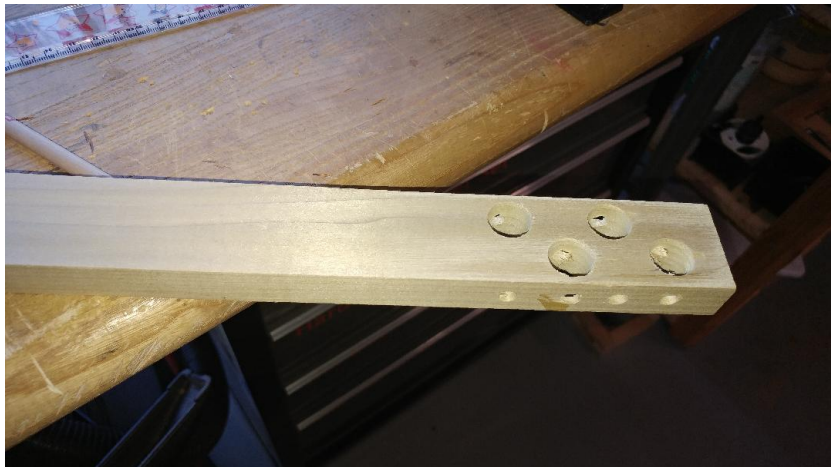


Fig.2

Test fit the tuners and with a reamer or round file *slowly* start enlarging the holes until the pegs rest snugly in position as shown in Fig. 3.

Now is a good time to sand and round the corners everywhere on the spine *except* on the portion that will be the fingerboard. Leave that flat right to the edge.

With a narrow bladed saw make two parallel cuts about 1/8" deep and about 3/16" apart just below the peg holes. Use the blade of a flat head screw driver to snap out the wood between the two cuts to leave a wide groove. File the bottom of the groove flat. This is where the *nut* will go.



Fig.3



Fig. 4

Using a narrow saw in the 90 degree channel of a miter box cut grooves for the frets into the neck approximately $\frac{1}{16}$ " deep at these distances from the nut groove as shown in Fig. 4.

1st fret: $\frac{15}{16}$ "

2nd fret: $1 \frac{13}{16}$ "

3rd fret: $2 \frac{5}{8}$ "

4th fret: $3 \frac{7}{16}$ "

5th fret: $4 \frac{1}{8}$ "

6th fret: $4 \frac{13}{16}$ "

7th fret: $5 \frac{1}{2}$ "

8th fret: $6 \frac{3}{16}$ "

9th fret: $6 \frac{3}{4}$ "

10th fret: $7 \frac{5}{16}$ "

11th fret: $7 \frac{7}{8}$ "

12th fret: $8 \frac{3}{16}$ "

Try to keep the channels neat as that will make setting the frets way easier.

Next remove the pegs, but make note which peg goes in which hole as they will all be custom fitted. If you are going to stain the spine, now would be a good time to do it. Try and keep wood stain out of the peg holes.

The Box

The box doesn't actually have to be one that once held cigars, but real cigar boxes have a certain charm. As long as it is wood (although I will briefly discuss other materials later) that is relatively thin and of the proper dimensions, it will serve. Fig. 5 Shows the type I typically use. Remove the inner wood centering fittings, they only serve to dull the sound if you leave them in



Fig.5

You can use your box as it comes or decorate it in whatever fashion you please. Lately I have chosen to use a laser cutter to engrave decorative patterns on the surface, but you can also paint it, stain it or even to some degree carve it. Making your instrument an individual and unique piece is half the fun. (Fig.6.)



Fig.6

You are going to want to make sound holes in the face of the box. I have usually gone with laser cutting violin style “f” holes, but you can make them any shape you please. If you don’t have access to a laser cutter, you can use a hole-cutting bit to make round holes or cut a custom shape with a coping saw. I would avoid the typical central round hole as seen on commercially made guitars and ukes simply because it will expose the spine in an unaesthetic way.

The Spine: Part 2

Lay the spine on the box with the end opposite the peghead protruding over the end about $\frac{3}{4}$ ". Mark with a pencil on the spine both places where it is at the end of the box. On the ends of the box mark the width of the spine and its thickness.

Where you marked on the spine saw a 1/8" deep groove and then another 1/4" to the box side of the first groove as shown in fig. 7.



Fig.7

Using a flathead screwdriver, carefully snap out the wood between the two grooves on either side as shown in Fig.8. Sand the bottom of the resulting channel flat.

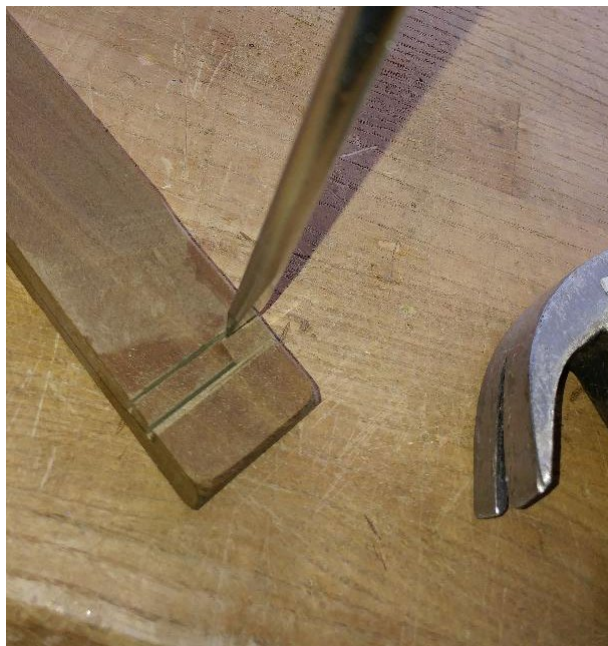


Fig. 8

With a jigsaw, make a cut into the face of the spine narrowing it by about half so that you end up with a curved depression with two little “shelves” at either end. Don’t throw away the piece of wood you remove. (Figs. 9 and 10.) This is to keep the spine out of contact with the top so it can vibrate freely.



Fig. 9



Fig. 10

Next you want to affix the flat face of the piece of wood you removed to the *back* of the part of the spine you cut out using epoxy. Clamp until the epoxy has set. Make sure to center the piece correctly so that it is inside the little “shelf” cuts so as to save yourself work later (fig. 11).



Fig. 11

Once the epoxy has set we are ready to start setting the frets.

If the wire has an excessive curve, start by straightening it out as best you can. Using the nippers cut your fret wire into twelve 1 ½” lengths. File the ends of the wire pieces flat.

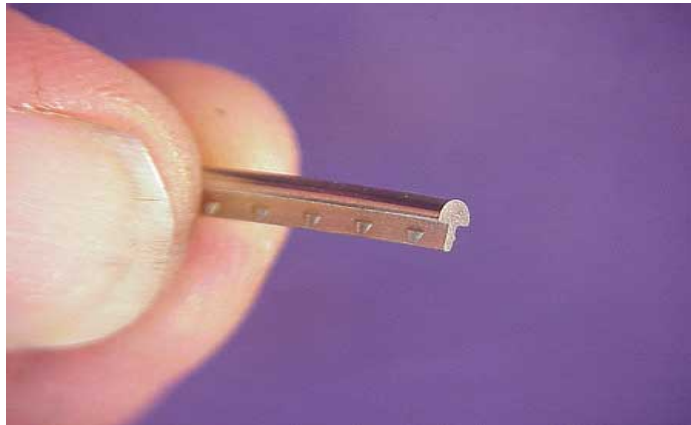


Fig.12

Using a fret dressing block can be helpful. That is basically a piece of the same lumber you used to make the neck with a groove cut in it sized to accept a piece of fret wire. It can make cutting fret wire easier and filing as well particularly if you are using a fret file. (Fig 13)

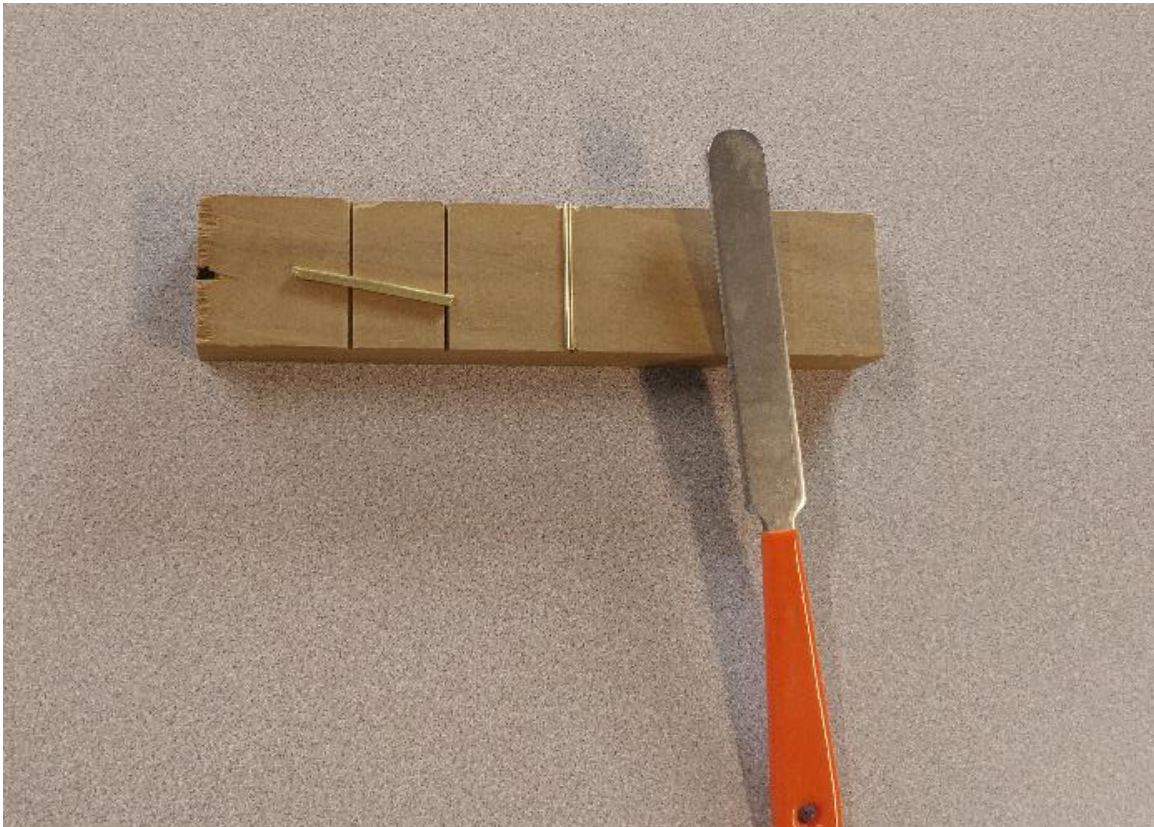


Fig. 13

Make note that fret wire has a sort of T-shaped cross section. The rounded upper part goes on the outside and the barbed lower part goes in the slot you made for the fret (Fig.12).

You are working with a five minute set time on the epoxy so you need to work relatively quickly. Before you mix the epoxy make sure you have everything laid out where you need it.

Mix some epoxy and apply a small amount to each fret and place one in each slot. Put a piece of scrap lumber over them and clamp tightly in place while the epoxy sets (Fig.14).



Fig. 14

Next the nut, the piece of material used to raise the strings above the frets must be made and put in place. I usually use a piece of $\frac{3}{16}$ " Plexiglas that has been cut to $1\frac{1}{2}$ " x $\frac{1}{4}$ " on a laser cutter, but you can also cut it out with a saw or Dremel tool. Plexiglas is a really good material as it is strong and has no particular grain so I recommend it over most woods for this purpose. Bone can be used if you have some or even stone, but of these Plexiglas is the easiest to work with.

With a bit of patience you should be able to work the piece to fit the nut groove in a short time. Set it in place with epoxy and clamp.

Assembly

We are now ready to prepare to join the box to the spine. There are a few steps involved.

Where you marked on the box for the position of the spine, you will need to saw out a portion of the box top, and with some boxes a bit of the box bottom to fit the spine in place. Carefully crack out the piece where the



Fig.15

Spine will slot in with a pliers. (Fig.15) Do this at both ends.

Mix a small amount of epoxy and apply to the small “shelf areas of the spine and insert into the top cut outs and clamp. Let set (Fig. 16).

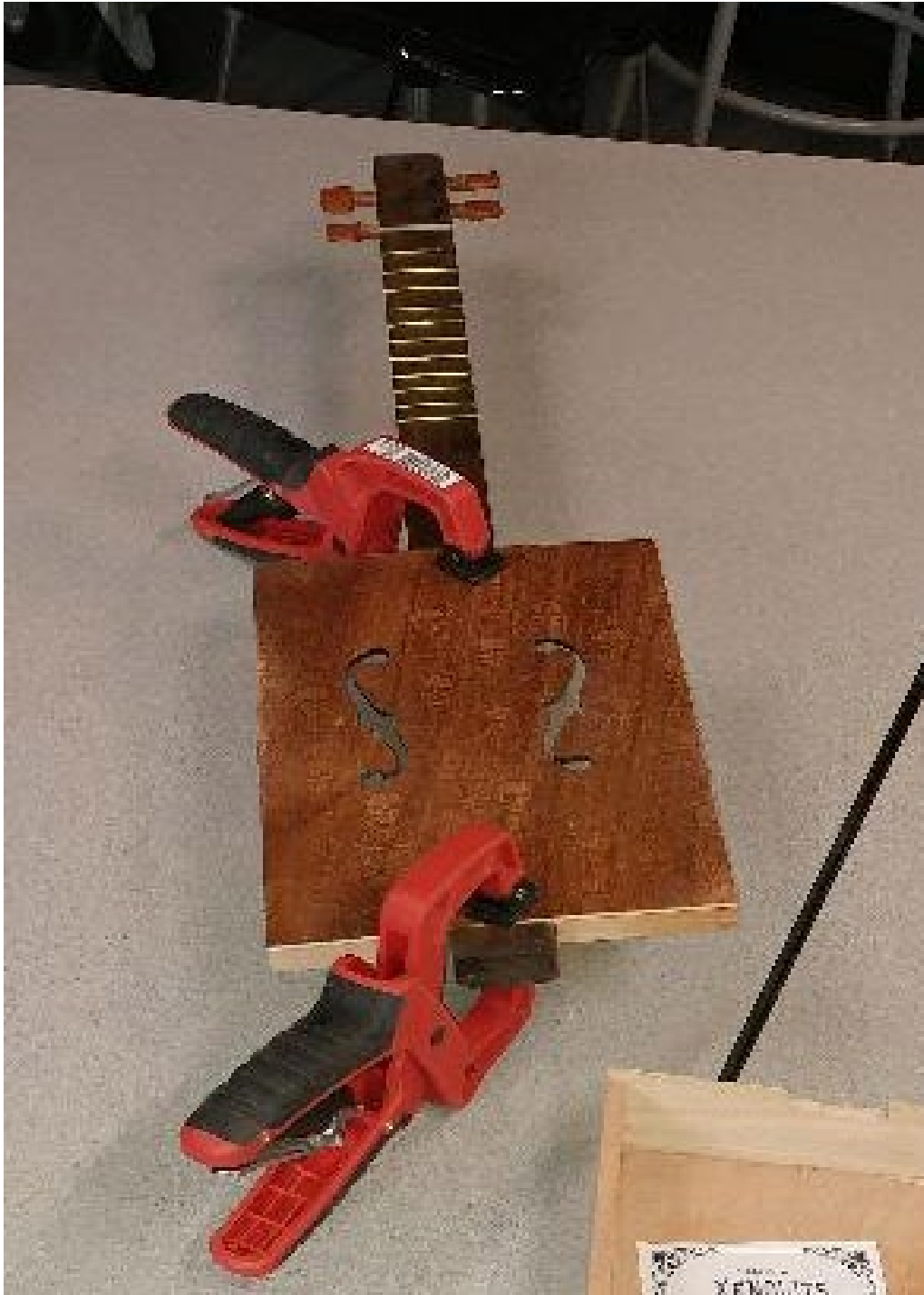


Fig. 16

Take a short length of dowel and cut and sand so it will fit *exactly* and tightly between the top and bottom of the box. Epoxy it in place on the bottom clear of where the spine will go, but near the location of where the bridge will be (Fig. 17).



Fig. 17

Mix more epoxy and apply all around the inside edge where the two halves of the box meet as well as to the underside of the parts of the spine that will make contact with the box. Put together and clamp (Fig. 18)

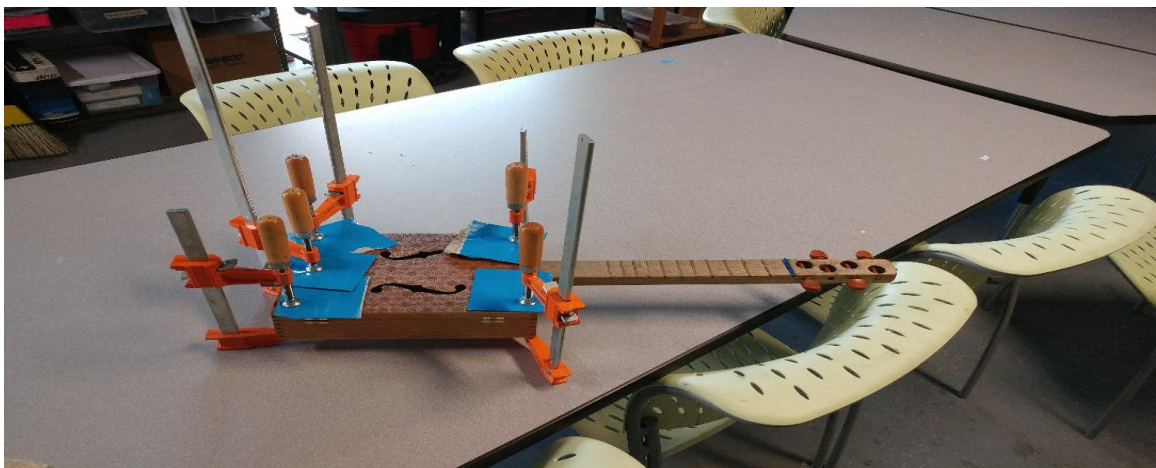


Fig. 18

At this point you are going to want to cut grooves in the nut for where the strings will go. On some instruments I also put tiny screw eyes to guide the strings to their proper groove usually if I have made an error in drilling the holes in the tuning pegs. Some pegs come pre-drilled, some do not so each case demands a slightly different solution (Fig. 19).

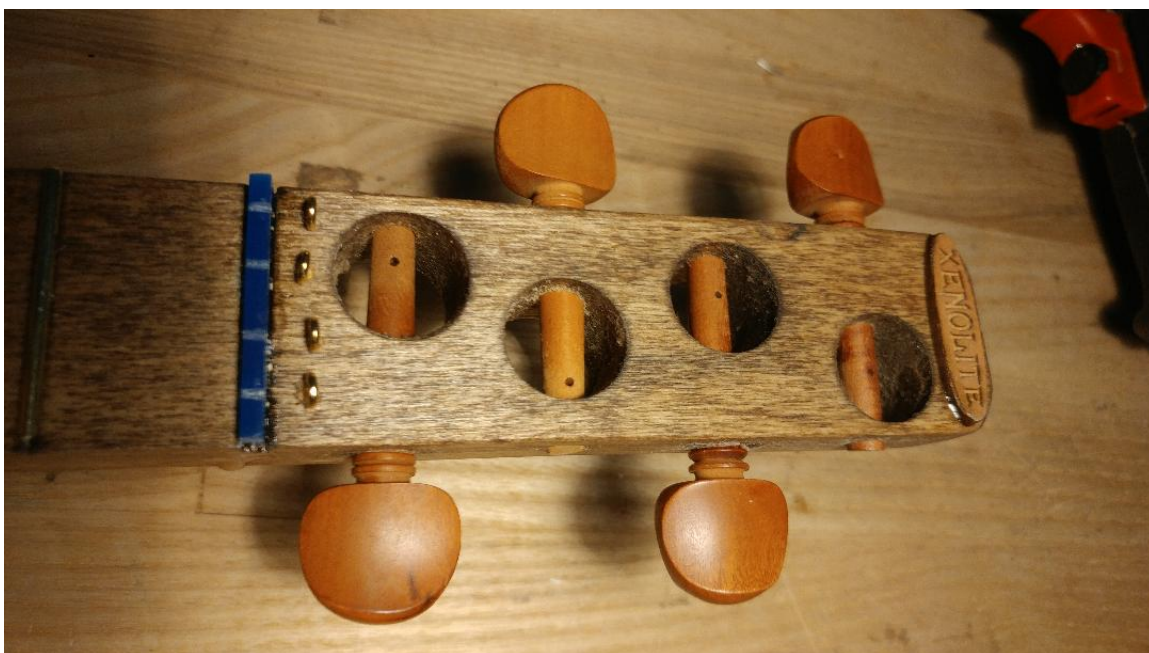


Fig. 19



Fig. 20

Using the 1/16" drill bit, drill four evenly spaced holes through the tailpiece. You can also set tiny screw eyes here if it helps you space the strings properly.

Now you need a bridge. I have made them all kinds of ways.



Generally a small piece of thin wood about 2- 2 ½ “ wide will work with a 2” x 1/8” 3/16” piece of Plexiglas epoxied to it will work just fine. If you think you might want to make adjustments of your action maybe start with it about 1/4” high and plan on filing it down after the fact. The bridge does not get glued in place. It should remain moveable.

At this point you are ready to string up your instrument.

You can use a number of tunings. DGBE is a standard baritone uke tuning. You can also use GCEA or GDAE. However you find it easiest to make chords.

Don't expect your instrument to stay in tune right away. The strings will take a few hours to hold the right tension and then you will have to play it for a while before it gets into the mood to be there. Patience.

Happy music making!

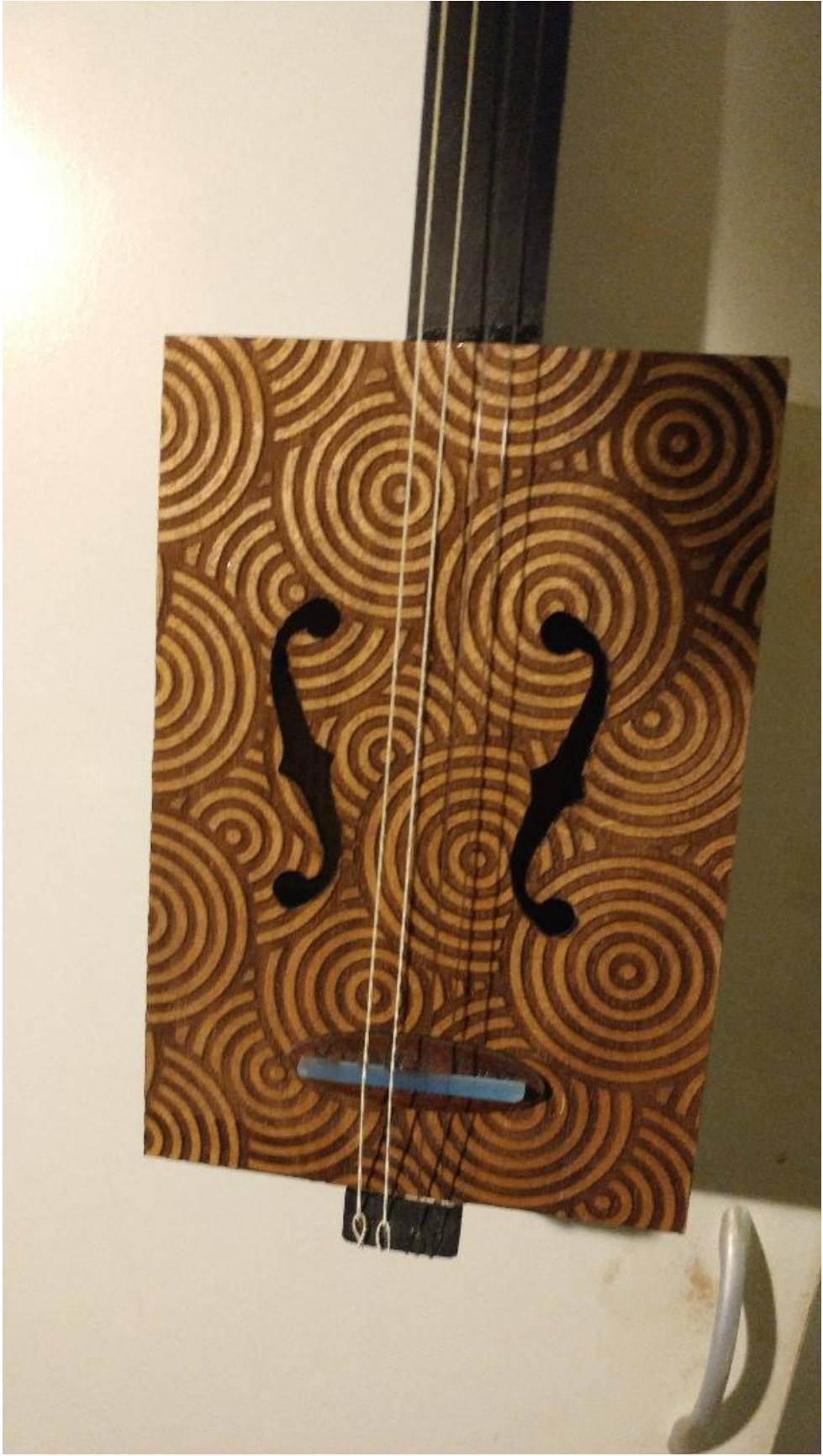


Using a cookie tin type box will give you an instrument with a banjo-like sound.



Boxes with different shapes can be used. Also note that the frets on this instrument are made of wood. Narrow dowels or even toothpicks can be used.



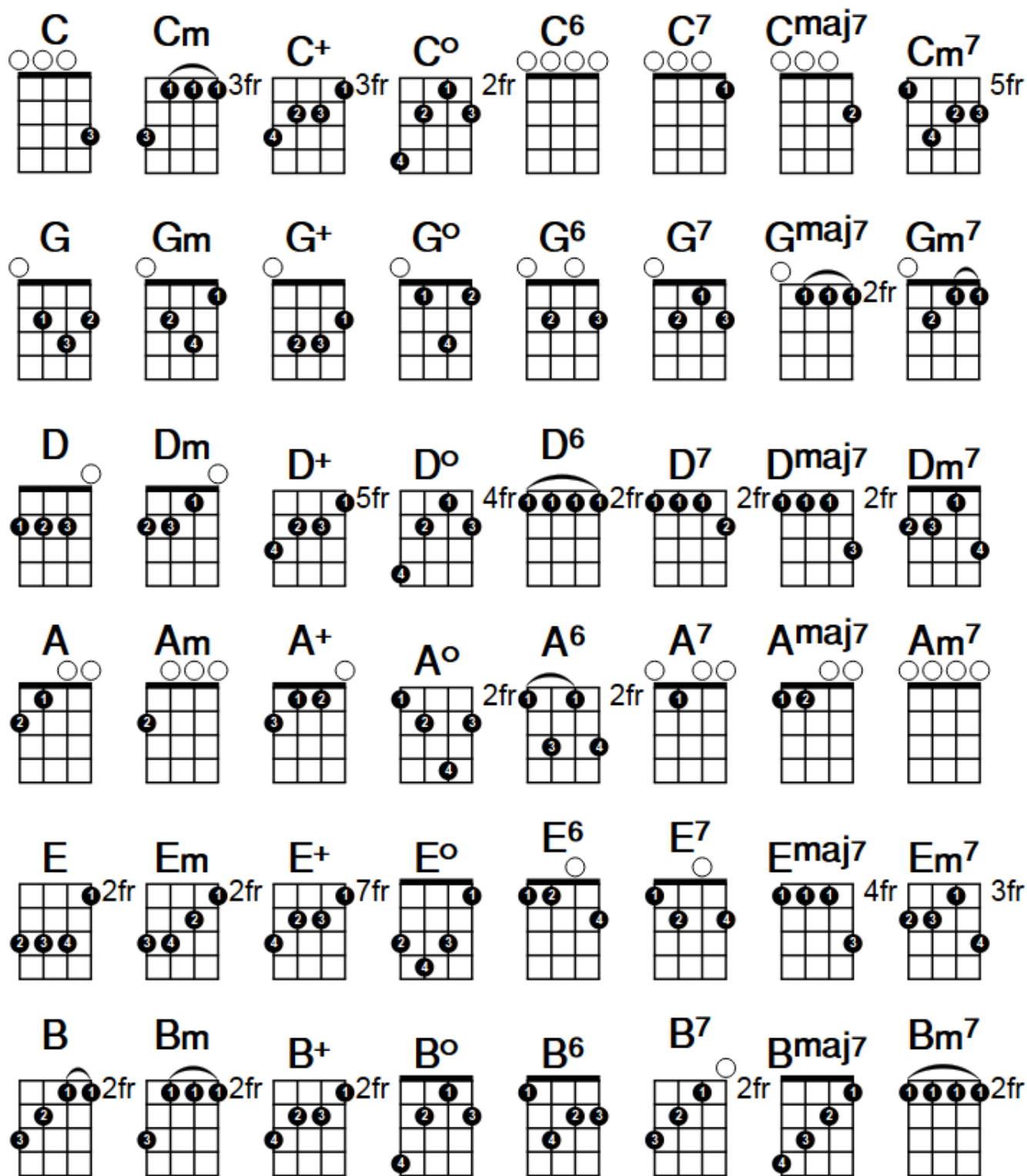






With my first workshop class and a primitive version of this instrument that can be built in a couple of hours.





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Seth K. Deitch is an author, artist, musician, publisher, tinkerer and grumpy old man who resides in Watertown, Massachusetts where he writes science fiction, creates collages, makes cigar box instruments and constantly wonders if he will make rent.